

What is claimed is:

1 1. An apparatus, comprising:
2 a cable modem terminating system having a plurality of cable modem terminating
3 system modules, said cable modem terminating system including a communication port;
4 a spectrum analyzer having a communication port;
5 wherein said spectrum analyzer and said cable modem terminating system
6 modules are coupled together at least via their respective communication ports, said cable
7 modem terminating system modules employing respective upstream channels that are
8 selected as a function of information supplied by said spectrum analyzer.

1 2. The invention as defined in claim 1 wherein said spectrum analyzer and said
2 cable modem terminating system modules are further coupled via a spectrum controller
3 that is coupled to said respective communication ports of said spectrum analyzer and said
4 cable modem terminating system modules, said spectrum controller selecting, as a
5 function of at least information received from said spectrum analyzer, said respective
6 upstream channels employed by said cable modem terminating system modules.

1 3. The invention as defined in claim 1 wherein spectrum analyzer determines a
2 power level for each upstream channel coupled to it.

1 4. The invention as defined in claim 1 wherein said spectrum analyzer supplies,
2 via at least their respective communication ports, statistics regarding interference on at
3 least one upstream channel to said cable modem terminating system modules.

1 5. The invention as defined in claim 1 wherein said spectrum analyzer and said
2 cable modem terminating system modules are further coupled via a spectrum controller
3 that is coupled to said respective communication ports of said spectrum analyzer and said
4 cable modem terminating system modules, and wherein said spectrum analyzer supplies
5 to said spectrum controller via at least their respective communication ports statistics
6 regarding interference on at least one upstream channel.

1 6. A method for use in connection with a cable modem system having a cable
2 modem terminating system module and a spectrum analyzer each having a
3 communication port, the method comprising the step of searching for a candidate channel
4 having a specified bandwidth within the spectrum allocated for use as upstream channels
5 that are indicated by said spectrum analyzer to have an acceptable noise level over a
6 prescribed period of time.

1 7. The invention as defined in claim 6 wherein said searching step failed to find a
2 channel with an acceptable noise level over said prescribed period, the method further
3 comprising the steps of:
4 reducing said specified bandwidth; and
5 repeating said searching step.

SUBA' → 1 8. The invention as defined in claim 6 wherein said searching step failed to find a
2 channel with an acceptable noise level over said prescribed period, the method further
3 comprising the steps of:
4 reducing said prescribed period of time; and
5 repeating said searching step.

1 9. The invention as defined in claim 6 wherein said cable modem system further
2 comprises a plurality of cable modems, said method further comprising the step of:
3 when said searching step finds a channel with an acceptable noise level over said
4 prescribed period, instructing said plurality of cable modems to employ said found
5 channel for upstream communications.

1 10. The invention as defined in claim 6 wherein said cable modem system further
2 comprises a plurality of cable modems, said method further comprising the step of:
3 when said searching step finds a plurality of channels that each have an acceptable
4 noise level over said prescribed period, instructing said plurality of cable modems to
5 employ for upstream communications said found channel that has the minimum noise
6 power.

1 11. A method for use in a spectrum controller of a cable modem system having a
2 cable modem terminating system and a spectrum analyzer, said spectrum controller, said
3 cable modem terminating system, and said spectrum analyzer each having a
4 communication port and each being coupled to the other, at least indirectly, via their
5 respective communication ports, the method comprising the step of:

6 setting a searched-for bandwidth to a maximum upstream channel bandwidth;

7 developing a set of candidate channels that have said searched-for bandwidth
8 within the spectrum allocated for use as upstream channels;

9 obtaining from said spectrum analyzer a noise power level for each candidate
10 upstream channel having a bandwidth equal to said searched-for bandwidth;

11 eliminating any candidate upstream channel that has a bandwidth equal to said
12 searched-for bandwidth and an unacceptable noise level over a prescribed period of time;

13 transmitting to said cable modem terminating system a lowest-noise-power one of
14 said candidate channels that remains when there is at least one candidate channel that is
15 not eliminated from said set in said eliminating step, whereby said cable modem
16 terminating system can instruct cable modems to use said lowest noise power candidate
17 channel as an upstream channel.

1 12. The invention as defined in claim 11 wherein, when said eliminating step
2 eliminates all of said candidate upstream channels, said method further comprises the
3 steps of :

4 setting said searched-for bandwidth to a bandwidth for an upstream channel that is
5 the next narrowest bandwidth size than the searched-for bandwidth size employed in the
6 immediately preceding eliminating step; and

7 repeating said developing, eliminating and transmitting steps.

1 13. A method for use in a cable modem terminating system of a cable modem
2 system having a spectrum analyzer, said cable modem terminating system and said
3 spectrum analyzer each having a communication port and each being coupled to the
4 other, at least indirectly, via their respective communication ports, the method comprising
5 the step of:

6 setting a searched-for bandwidth to a maximum upstream channel bandwidth;
7 developing a set of candidate channels that have said searched-for bandwidth
8 within the spectrum allocated for use as upstream channels;
9 obtaining from said spectrum analyzer a noise power level for each candidate
10 upstream channel having a bandwidth equal to said searched-for bandwidth;
11 eliminating any candidate upstream channel that has a bandwidth equal to said
12 searched-for bandwidth and an unacceptable noise level over a prescribed period of time;
13 instructing cable modems served by said cable modem terminating system to
14 employ as an upstream channel a lowest-noise-power one of said candidate channels that
15 remains when there is at least one candidate channel that is not eliminated from said set in
16 said eliminating step.

1 14. The invention as defined in 13 wherein, when said eliminating step eliminates
2 all of said candidate upstream channels, said method further comprises the steps of:

3 setting said searched-for bandwidth to a bandwidth for an upstream channel that is
4 the next narrowest bandwidth size than the searched-for bandwidth size employed in the
5 immediately preceding eliminating step; and
6 repeating said developing, eliminating and instructing steps.

1 15. A method for use in a spectrum controller of a cable modem system having a
2 cable modem terminating system and a spectrum analyzer, said spectrum controller, said
3 cable modem terminating system, and said spectrum analyzer each having a
4 communication port and each being coupled to the other, at least indirectly, via their
5 respective communication ports, the method comprising the step of:

6 initializing a searched-for bandwidth to a maximum upstream channel bandwidth;
7 developing a set of candidate channels that have said searched-for bandwidth
8 within the spectrum allocated for use as upstream channels;

9 obtaining from said spectrum analyzer a noise power level for each candidate
10 upstream channel having a bandwidth equal to said searched-for bandwidth;

11 selecting the candidate upstream channel that has a bandwidth equal to said
12 searched-for bandwidth and the lowest noise level over a prescribed period of time;

13 assigning a best throughput candidate as the one of said candidate selected in said
14 selecting step or a stored widest candidate, if any; and

15 determining if a channel of lower bandwidth than said searched-for bandwidth can
16 have a greater throughput than the best throughput candidate set in said setting step.

1 16. The invention as defined in claim 15 wherein, when the result of said
2 determining step is that a channel of lower bandwidth than the candidate upstream
3 channel selected in said selecting step can have a greater throughput than the selected
4 candidate upstream channel, the method further includes the steps of:

5 storing said candidate set in said setting step as a widest candidate;

6 setting said searched-for bandwidth to a bandwidth for an upstream channel that is
7 the next narrowest bandwidth size than the searched-for bandwidth size employed in the
8 immediately preceding developing step; and

9 repeating said developing, obtaining, selecting, assigning, and determining steps.

1 17. The invention as defined in claim 15 wherein, when the result of said
2 determining step is that a channel of lower bandwidth than the candidate upstream
3 channel selected in said selecting step cannot have a greater throughput than the selected
4 candidate upstream channel, the method further includes the step of commanding
5 modems coupled to said cable modem system to employ said best throughput candidate
6 for upstream communication.

1 18. The invention as defined in claim 15 wherein said method further comprises
2 the step of repeating said initializing, developing, obtaining, selecting, assigning, and
3 determining steps at a prescribed later time.

1 19. The invention as defined in claim 15 wherein, when the result of said
2 determining step is that a channel of lower bandwidth than the candidate upstream
3 channel selected in said selecting step cannot have a greater throughput than the selected
4 candidate upstream channel, the method further includes the step of commanding
5 modems coupled to said cable modem system to employ said best throughput candidate
6 for upstream communication when said best throughput candidate has a significantly
7 better throughput than an upstream channel already being used by said cable modems.

1 20. The invention as defined in claim 19 wherein said method further comprises
2 the step of repeating said initializing, developing, obtaining, selecting, assigning, and
3 determining steps at a prescribed later time.

1 21. An apparatus, comprising:
2 a plurality of cable modem terminating system modules each having a
3 communication port;
4 a spectrum analyzer having a communication port;
5 wherein said spectrum analyzer and said cable modem terminating system
6 modules are coupled together at least via their respective communication ports, said cable
7 modem terminating system modules employing respective upstream channels that are
8 selected as a function of information supplied by said spectrum analyzer.

1 22. A method for use in connection with a cable modem system having a cable
2 modem terminating system module and a spectrum analyzer each having a
3 communication port, the method comprising the step of searching for a best throughput
4 channel over a prescribed period of time as a function of noise information developed by
5 said spectrum analyzer.